C **B3C028** **Total Pages:3**

Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017

Course Code**: CH203**

Course Name**: PARTICLE TECHNOLOGY (CH)**

Max. Marks: 100 Duration: 3Hours

PART A

Answer any two Questions

1. a. A mixture of quartz and galena of size range from 0.025mm to 0.075mm is to be seperated into two pure fractions using hindered settling process. What minimum apparent density of the fluid that will give this seperation? The density of galena is 7500 kg/m^3 and the density of quartz is 2650 kg/m^3. (5)

   b. How can the particle size distribution represented graphically? What are the advantages? (5)

   c. Which industrial screening equipment will you choose for handling sticky or clay like material? Discuss working of the equipment. (5)

2. a. A quartz mixture is screened through a 10 mesh screen. The cumulative screen analysis of the feed, overflow and the underflow are given in the following table:

Mesh	Dp , mm	Cumulative mass fraction greater than Dp		
		Feed	Overflow	Underflow
4	4.699	0	0	0
8	2.362	0.15	0.43	0
10	1.651	0.47	0.85	0.195
28	0.589	0.94	1	0.91
65	0.208	0.98	-	0.975
Pan	-	1	-	1

   Calculate the mass ratios of overflow to feed and underflow to feed.Also calculate the overall effectiveness of the screen. (10)

   b.“Capacity and effectiveness are opposing factors in industrial screening”. Comment on this statement. (5)

3. Finely divided clay is used as a catalyst in petroleum industry. It has a density of 1.2 gm/cc and has a specific surface ratio of 1.01.The size analysis is given below:

Average dia(cm)	0.0252	0.0178	0.0126	0.0089	0.0038
Mass fraction	0.0880	0.1780	0.2930	0.1940	0.2470

Calculate specific surface of the catalyst. (15)

PART B

Answer any two questions

4. a. Which filtration technique can be used for separating suspension from coarse, granular solids and drying crystals? Describe the principle of this process. (8)

b. 'Electrical properties of materials are exploited in order to effect the separation'. Write the working of air separation technique mentioned. (7)

5. A leaf filter with $1m^2$ of filtering surface operated at a constant pressure of 1.8 bar gave the following results:

Filtrate volume (m^3)	3.99	6.09	7.65	9.63	11.33
Time (min)	10	20	30	45	60

The original slurry contained 10% by weight of solid calcium carbonate (specific gravity =2.72) in water and the cake formed is essentially incompressible.

i) Determine the time required to wash the cake formed at the end of 70 minutes of filtering at the same pressure using 3 m^3 of wash water. (7.5)

ii) If the time for dumping the cake and reassembling the press is 60 minutes, what is the optimium cycle time and what is the volume of filtrate collected per cycle? Assume wash water is used in the same proportion to the final filtrate as in ((i). (7.5)

6. a. What are filter aids? How can they be applied? (4)

b. What are the different stages of washing of filter cake? (5)

c. State the advantages of centrifugal separators over gravity separators. (6)

PART C

Answer any two questions

7. a. It is intended to transport a granular material horizontally form storage shed to processing plant. If the tonnage of material is very large recommend the type of conveyor that you choose. (4)

   b. Particles of average feed size 0.25 cm is crushed to a product size of 0.05 cm at a rate of 15 tons/hr. At this rate crusher consumes 32 kW of power of which 2 kW is required for running mill empty. What would be the power consumption if 10 tons/h of this product is further crushed to 0.01 cm size in the same mill. Assume Rittingers law is applicable. (10)

   c. Differentiate storage bins, silos and hoppers. (6)

8. a. Mention a mixer used in scrapping rubber and plastic materials. Explain the working. (6)

   b. A set of crushing rolls 1 m diameter are set that they are 15 mm apart with a width of crushing surface 60cm and angle of nip is 30°. The mill is operated at 60 rpm calculate the actual capacity of the mill in tons/day. (Specific gravity of the material =2) (10)

   c. What are the factors for selection of a conveyor? (4)

9. a. A ball mill 1 m diameter is operated at 90 rpm. It is found that the mill is not working satisfactorily. Suggest a modification in the working operation. (4)

   b. Which are the types of conveyors preferred in conveying fine materials at long centre distances? Explain the working. (8)

   c. Show that three laws of crushing can be derived from the basic equation

   $$dE/dL = cL^n$$

   Where 'E' is the energy required, 'L' is the size of the material and 'c' and 'n' are constants. (8)